

Portland, Oregon  
November 2, 2009

2009 National Forum  
on  
Contaminants in Fish

## Eat Fish, Be Smart, Choose Wisely

Human Health Assessment  
of Puget Sound Fish

Washington State Department of Health

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and Toxicology

### Department of Health (DOH) Background

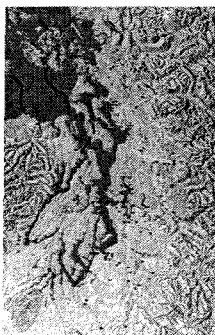
- Office of Environmental Health, Safety and Toxicology (OEHST)
- What does OEHST do?
  - Technical assistance to Local Health Jurisdictions
  - Food safety
  - Zoonotic diseases
  - Human health assessments

### Puget Sound

- History of chemical contamination
  - Urban embayments



### Puget Sound

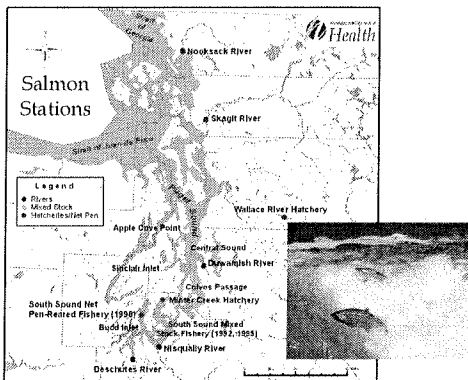
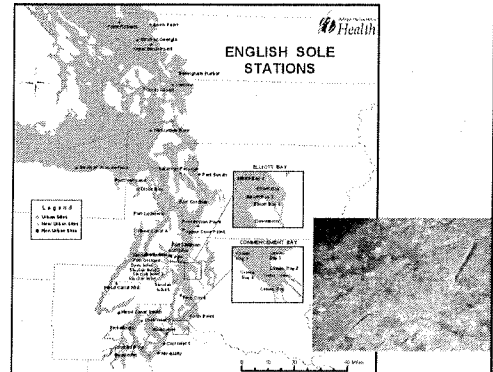
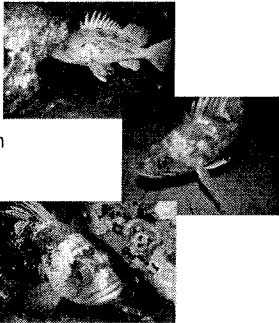


### Puget Sound Assessment and Monitoring Program (PSAMP)

- Began in 1988
- Purpose
  - Monitor long-term contaminant trends
    - Biological Resources
    - Physical Environment and Habitat
    - Nutrients and Pathogens
    - Toxic Contaminants

## PSAMP - Fish

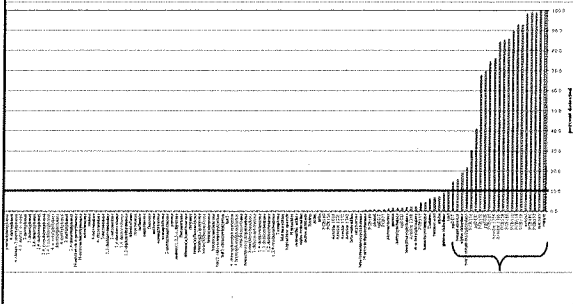
- Rockfish
  - Brown rockfish
  - Copper rockfish
  - Quillback rockfish
  - Yelloweye rockfish
- English sole
- Salmon
  - Chinook salmon
  - Coho salmon



## Step 1

Determine contaminant concentrations  
in Puget Sound fish

## Contaminant Screening



## Contaminants of Concern Human Health

- Mercury
- PCBs
  - Arsenic
  - Benzyl Alcohol
  - Bis(2ethylhexyl)phthalate
  - Chlordane
  - Copper
  - DDD DDE DDT

## Hg and PCBs in PS fish

	Hg (ppm)	PCBs (ppb) Total Aroclors
Rockfish	0.287	55.3
Urban	0.368	134
Near-urban	0.225	45.1
Non-urban	0.218	5.8
English Sole	0.060	38.6
Urban	0.072	73.6
Near-urban	0.053	17.2
Non-urban	0.051	9.3
Chinook	0.093	54.0
In-river	0.096	50.2
Marine	0.082	73.2
Coho	0.039	31.8
In-river	0.038	31.1
Marine	0.051	34.4

AGE - Hg  
Length is not a good predictor of age  
Anglers rarely target a single species  
Species may be difficult to identify

### LOCATION - PCBs

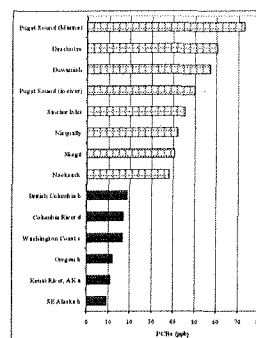
#### LOCATION - PCBs

- Urban
- Near-Urban
- Non-Urban

Chinook - Higher contaminant values  
Higher trophic level  
Diet/life history/age  
Fat content

Coho - Lower contaminant levels  
Trophic level  
Fat content  
Age/life history

PCB levels in Puget Sound Chinook vs Washington coast, Alaska, Oregon, and British Columbia (solid bars)



## Step 2

Estimate the amount of Puget Sound fish eaten by public

## Consumption Surveys

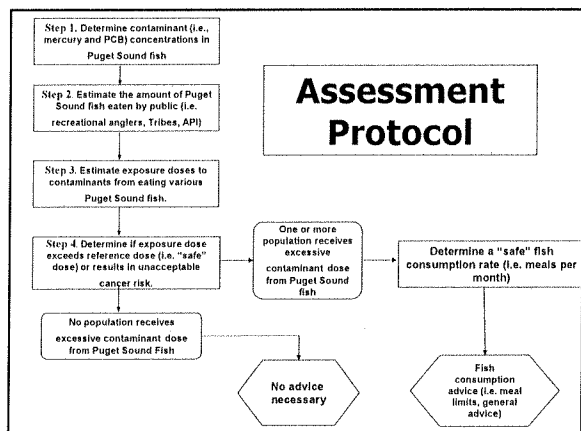
- Tribes
  - Suquamish
  - Tulalip
  - Squaxin Island
- Recreational
- Asian & Pacific Islanders

## Step 3

Estimate exposure doses to contaminants from eating various Puget Sound fish

## Step 4

Determine if exposure dose exceeds reference dose (i.e. "safe" dose) or results in unacceptable cancer risk

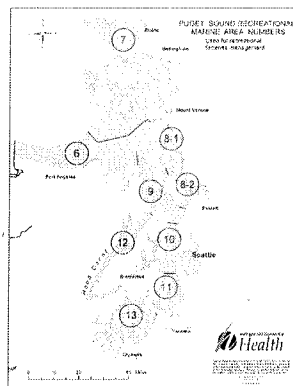


## How Do We Develop a Fish Advisory?

- Calculate meal limits
  - 8-oz meals per month or week
  - Based on PCBs, Hg, and additive endpoints
- Consider benefits of eating fish
- Create a clear message

## Rockfish Meal Limit Calculations

Location	Average Mercury concentration (ppm)	Average PCB concentration (ppb)	Calculated meals per month based on mercury	Calculated meals per month based on PCBs	Calculated meals per month based on additive endpoint
Non-urban locations	0.218	5.8	3.7	28	3.4
Near-urban locations	0.225	45.1	3.6	3.6	2.2



## Puget Sound Rockfish



Rockfish consumption advice is based on contaminant levels in brown, quillback, and copper rockfish from Puget Sound. In addition to contaminant concerns, non-tiled harvest of yelloweye and canary rockfish is prohibited for conservation purposes.

### Puget Sound Rockfish

Marine Area/Location	Rockfish Species	Consumption Advice	Exceptions
6 thru 13	All Puget Sound Marine Areas	No consumption	None
6 thru 13	All Puget Sound Marine Areas	No consumption	None
6	San Juan Islands	No more than 1 meal per week	None
6.1	Deception Pass, Hope Island & Skagit Bay	No more than 1 meal per week	None
6.2	Port Susan/Port Gardner	No more than 1 meal per week	Yes
6.2	Mulholland Bay/Port Gardner	No more than 2 meals per month	None
6	Admiralty Inlet	No more than 1 meal per week	None
10	Seaside-Brewsterman	No more than 1 meal per week	Yes
10	Shoof Bay	No consumption	None
10	Shoof Bay	No consumption	None
11	Tacoma-Vashon	No more than 1 meal per week	None
12	Hoquiam Canal	No more than 1 meal per week	None
13	South Puget Sound	No more than 1 meal per week	None

\* Non-tiled harvest of yelloweye and canary rockfish is prohibited for conservation purposes.

## English Sole & Other Flatfish

The following advice applies to consumption of Puget Sound flatfish including English sole, starry flounder, and rock sole. No restrictions means you can eat 2 to 3 meals per week.

### Puget Sound English Sole & Other Flatfish\*

Marine Area/Location	Consumption Advice	Exceptions
6	East Juan de Fuca Strait	No restrictions
7	San Juan Islands	No restrictions
6.1	Deception Pass, Hope Island & Skagit Bay	No restrictions
6.2	Port Susan/Port Gardner	No more than 2 meals per month
6.2	Mulholland Bay/Port Gardner	No more than 2 meals per month
9	Admiralty Inlet	No restrictions
10	Seaside-Brewsterman	No restrictions
10	Shoof Bay	No more than 2 meals per month
10	Eagle Harbor	No more than 1 meal per week
10	Port Orchard/Perrine	No more than 1 meal per week
10	Seaside-Brewsterman	No more than 1 meal per month
11	Tacoma-Vashon	No restrictions
12	Hoquiam Canal	No more than 2 meals per month
13	South Puget Sound	No restrictions
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\* Consumption advice for consuming other flatfish such as lingcod, are not included in the above advice.

## Estimated PCB Levels

- No data for Bellingham Bay, Budd Inlet, Everett Harbor, and Port Angeles.

$$[mPCB] = e^{1.64 * [sPCB]^{0.35} * e^{0.13 * Age}}$$

Where:

- mPCB = concentration of PCBs in muscle as sum of 3 Aroclors, ng/g, wet wt.,
- sPCB = concentration of PCBs in sediments as sum of 3 Aroclors, ng/g, dry wt.,
- Age = fish age in years.

## Estimated PCB Levels in E. sole based on Matched PCB Sediment Concentrations

Location	Sediment N	Sediment PCB concentration (ppb, dry wt.)	Predicted E. sole concentration (ppb, wet wt.)	Meals per month
Bellingham Bay	45	14.8	29.9	5
Budd Inlet	9	13.9	29.3	5
Everett Harbor	33	355	91.0	2
Port Angeles	22	12.7	28.3	6

## Puget Sound Salmon

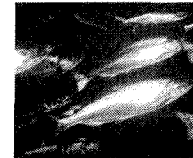


Puget Sound Salmon		All Puget Sound Marine Areas
Marine Area	Salmon Species	Consumption Advice
6 thru 12	Chinook	No more than 1 meal per week
6 thru 13	Chinook (Blackmouth)	No more than 2 meals per month
6 thru 13	Coho*	No restrictions
6 thru 13	Chum, Pink, Sockeye**	No restrictions

\* High-end consumers (more than 2 meals per week) should follow DNR's fish preparation recommendations.  
 \*\* Chum, pink, and sockeye salmon were not sampled as part of PSAMP. Data from other sources show that these species tend to have low PCB levels.

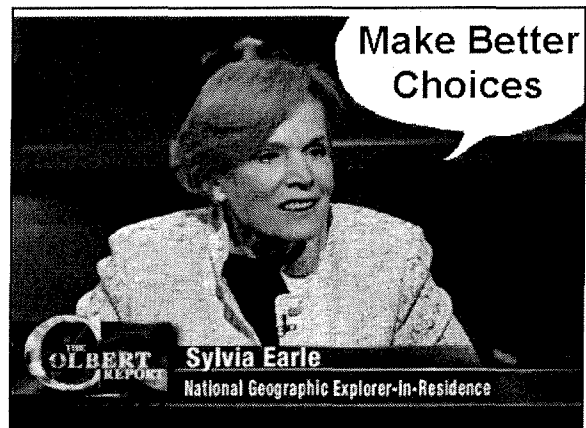
## Chinook Salmon Recommendations

- Puget Sound Chinook salmon may be consumed once (eight ounces) per week.
- Anglers who catch resident Chinook salmon (blackmouth) in the Puget Sound winter fishery should limit their consumption to two eight-ounce meals per month.



## Consumption Advice for All Fish

- General advice
  - Choose fish with lower contaminant levels
  - Grill, bake or broil/ remove skin
  - Choose a variety of species



## Risk Communication

- Media
- Signs
- Internet
- Printed materials
- Health care providers
- Tribes and local health jurisdictions
- Community groups



### Fish Facts for Healthy Nutrition

**Eat Fish, Eat Smart, Choose Wisely**

Fish is back and best, but trying to choose the healthiest benefits with concerns about environmental levels can leave you confused. Eat and eat, consumption is a smart choice, but don't go up on fish because fish is still an excellent health choice.

The American Heart Association recommends eating fish twice a week. Why? Because fish is a great source of protein, vitamins, and nutrients. Fish are loaded with omega-3 fatty acids, which provide protection from heart disease and are good for you, your children, and if you are pregnant, for your unborn child. It is important to remember that fish is not the healthy food and fish is healthy. The key is to make smart choices and eat fish that are low in mercury, PCBs, and other contaminants.

**Choose Wisely**  
 Eat fish that are low in mercury, PCBs, and other contaminants. Choose fish that are low in mercury, PCBs, and other contaminants. Choose fish that are low in mercury, PCBs, and other contaminants.

**What's the Washington State's Advice?**  
 The Washington State Department of Health (DOH) has issued a list of fish consumption advisories to help you make smart choices. Our advice will help you choose fish that are low in mercury, PCBs, and other contaminants. The advice is based on the latest scientific information and is intended to protect you and your family from the harmful effects of these contaminants.

**What You Can Do to Reduce Contaminants**

### Fish Facts for Healthy Nutrition

**Puget Sound Fish Consumption Advisory Areas**

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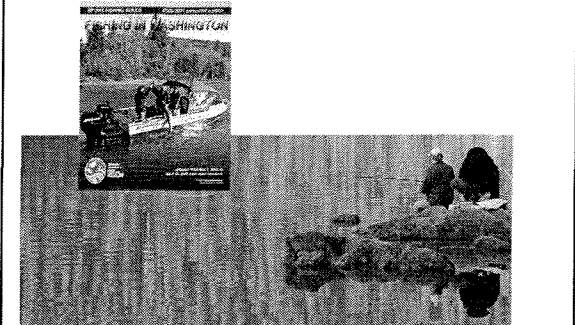
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## Outreach to anglers



### THE DUWAMISH RIVER

Within this urban watershed, the heart of a living river. Home to a variety of fish and wildlife, the Duwamish River is slowly being restored through the dedicated efforts of community members.

Years of industrial pollution and storage have left some noxious waste to eat. Fish that spend most of their lives in the river can accumulate heavy chemicals. Do not eat any resident fish (like steelhead trout) from the Duwamish River (including wild and farmed fish). They are not considered safe to eat because they spend most of their lives in the river and generally have higher levels of contaminants. PCBs are chemicals that can build up in fish tissues and are especially harmful to the developing individual in young children. Pregnant women and women who are in lactation should pay special attention to this important health message.

**Eat Fish, Eat Smart, Choose Wisely**  
 Fish is healthy food - but please, do not eat any resident fish (like steelhead trout) from the Duwamish River.

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## Data Gaps

- Obtain contaminant data in crab, shrimp, and bivalves
- Confirm levels in chum, pink and sockeye
- Obtain dioxin/furan data in PS species
- Assess PBDE levels in fish species
- Conduct a "market basket" survey of PCBs

## Puget Sound Partnership

- A community effort of citizens, governments, tribes, scientists and businesses working together to restore and protect the Sound
- Goal is to make P.S. healthy again.
- Roadmap to get it done is the "Action Agenda"



## Eat Fish

- American Heart Association – 2 meals/wk
- Eat a variety of fish, especially oily fish
- Benefits
  - Reduces cardiovascular disease risk
  - Beneficial effects on fetal development

## Resources

- State of Washington
  - <http://www.doh.wa.gov/fish>
  - <http://www.doh.wa.gov/ehp/oehas/fish/ps.htm>

